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Method and System for Detecting GNSS Spoofing Signals

TECH ID #: 727.3

Background

A team of researchers from the University of Calgary's Geomatics Engineering, PLAN Group, has developed a novel technique using a **moving antenna system** to identify spoofing threats on GPS signals. This technology relies on identifying spoofing signals by exploiting the fact that different GNSS signals sourced from a single transmitter have basically the **same spatial signature**.

Spoofing is a form of transmitting counterfeit location information by misleading GNSS receivers into generating false navigation signals. It is very hard to detect a spoofer since the spoofing signal is designed to have similar temporal and spectral characteristics as the authentic GPS signals. Current literature suggests that previously recommended methods operate after acquisition and tracking stages of a GPS receiver and that they need to separately acquire and track all authentic and spoofing signals which impose a high computational complexity.

Unlike the methods mentioned above, the detection technique employed by this system can prove to be very beneficial as the conventional GNSS receiver design with the dispreading correlation used here is capable of tracking spoofing and authentic signals simultaneously. Furthermore, implementation of the moving antenna approach has **low computational complexity** since it uses simple hardware and algorithms.

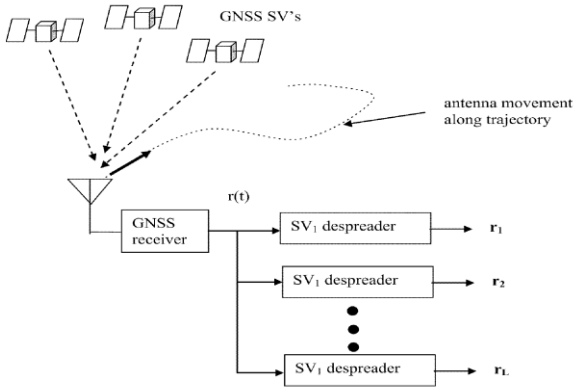

Figure 1

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This novel invention proposes to detect alleged GNSS signals with a synthetic array using a receiver antenna, which is randomly spatially translated as illustrated in figure 1. The spatial correlation is then determined by processing the signals and a high correlation between them signifies a possible inauthentic source for the GNSS signals.

Area of Application

- GPS Navigation Systems

Competitive Advantages

- This technique works in any wireless propagation conditions, line of sight or non-line of sight
- This system can be adopted by existing GNSS receivers or smartphones with no further hardware changes or additions and only a firmware or software change in some cases
- Minimizes the effects of standard ranging errors, as well as outliers, significantly improving location estimates
- Doesn't require the assumption of the distribution of the propagation delay estimates
- Doesn't require any external source of positional information
- Low power consumption & fast computation
- It offers accurate positioning, which could be used for proximity based notifications like location based mobile advertising, location based games, resource tracking, etc.

Stage of Development

- Extensive computer simulations and testing have been conducted. These simulations covered the probability of detection and probability of false alarm.

Intellectual Property Status

- Patent issued (US 7952519 B1)

Publications:

- A.Broudmandan, J. Nielsen, and G. LaChapelle, "Signal Detection Performance in Rayleigh Multipath Fading Environments with a Moving Antenna" IET signal Processing Journal, accepted for publication, May 2009
- A. Broumandan, J. Nielsen, and G. Lachapelle, "Performance of Narrowband Signal Detection under Correlated Rayleigh Fading based on Synthetic Array" International Journal of Antennas and Propagation, vol. 2009, Article ID 610109, 13 pages